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Sir:

Transmitted herewith for filing under 37 C.F.R. §1.53(b) is the patent application of:

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For: DISC CHANGER

☒ Specification (32 pages)☒ 12 sheets of drawings☒ Declaration and Power of Attorney☒ Return Receipt Postcard☒ An Assignment of the invention to Pioneer Corporation with PTO-1595☒ A certified copy of Japanese application(s) No.(s) 11-056969; dated March 4, 1999☒ A filing fee, calculated as shown below:

	(Col. 1)	(Col. 2)
FOR:	No. Filed	No. Extra
BASIC FEE		
TOTAL CLAIMS	4 - 20 =	* 0
INDEP CLAIMS	3 - 3 =	* 0
MULTIPLE DEPENDENT CLAIM PRESENTED		

Small Entity	
RATE	FEE
	\$345
x 9 =	
x 39 =	
+130 =	
TOTAL	

Other Than A Small Entity	
RATE	FEE
	\$690
x 18 =	0
x 78 =	0
+260 =	0
TOTAL	\$690


*If the difference in Col. 1 is less than zero,
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TITLE OF THE INVENTION

Disc Changer

BACKGROUND OF THE INVENTION

5 The present invention relates to a disc changer for use in a disc player adapted to reproduce an information recording medium such as CD (Compact Disc), particularly to a disc changer whose internal structure has been simplified.

10 There has been known a conventional disc changer for use in a disc player for reproducing an information recording medium such as CD, which disc changer has been disclosed by the applicant in its earlier Japanese Patent Application Laid-open No. 10-74353. The disclosed disc changer is so
15 fabricated that a user is allowed to insert a detachable magazine (accommodating a plurality of discs) into a disc player, such that one disc may be selected from the magazine so as to be moved to a reproducing position within the disc player.

20 As shown in Fig. 12A, the above mentioned conventional disc changer comprises i) a detachable magazine 2 capable of accommodating a plurality of trays 1 each mounting a disc, ii) a reproducing section 4 which includes a tray drawing means (not shown) and a disc reproducing means (not shown) and which can be driven vertically by a motor 3, iii) a control section
25 (not shown) for controlling the height of the reproducing section 4 and for controlling a movement of the tray drawing

means, iv) a plurality of stopper elements 5 for preventing the trays 1 from accidentally jumping out of the magazine 2.

The stopper elements 5 are arranged in a manner such that only one tray 1 (which has been selected) may be drawn out of the magazine 2, while preventing other trays 1 from jumping out of the magazine 2. In particular, the stopper elements 5 are urged by a coil spring (not shown) in the vertical direction so that each of them is movable along a support shaft 6.

As shown in Fig. 12B, when a selected tray 1 is to be drawn out of the magazine 2, the control section (not shown) will operate to cause the motor 3 to drive the reproducing section 4 in the vertical direction, and to cause the tray drawing means (not shown) to draw the selected disc out of the magazine 2. At this moment, the selected tray 1 is caused to push two nearest stopper elements 5 upward and downward respectively along the support shaft 6, thereby preventing the other trays 1 from jumping out of the magazine 2.

However, since the magazine 2 is a detachable member and thus there is a clearance between the magazine 2 and the internal wall of the disc player, also there is a clearance between the plurality of trays 1 and the plurality of stopper elements 5. Hence, as shown in Fig. 12C, when the reproducing section 4 is moved in the vertical direction, one or more trays 1 will possibly jump out of the magazine 2. As a result, the stopper elements 5 will become unable to

function as stopper means as originally expected.

Further, since the magazine 2 is usually designed to be able to accommodate a lot of trays 1 with a considerably high density, it is often difficult to correctly control the stopper elements 5 to allow only the movement of a selected tray by the tray drawing means while at the same time preventing other trays 1 from jumping out in the same direction.

On the other hand, although it is allowed to consider providing some sort of tray jump preventing means on the reproducing section 4, such a provision will however make the reproducing section 4 too complex in its structure, hence rendering it difficult to manufacture a disc player compact in size and cheap in cost.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved disc changer having a simplified internal structure, capable of smoothly drawing out only a selected tray (mounting a selected disc) from a magazine while at the same time effectively preventing other trays from jumping out in the same direction, thereby solving the above-mentioned problems peculiar to the above-discussed prior art.

In one aspect of the present invention, there is provided a disc changer for use in a disc player, said disc changer including a disc storing means for storing a plurality of

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discs arranged in a predetermined direction, a disc drawing means for drawing a selected disc from the disc storing means to a reproducing position within the disc player, a transporting means for transporting the disc drawing means in the disc arrangement direction, so that the selected disc drawn from the disc storing means can be reproduced in the reproducing position. In particular, the transporting means comprises moving member(s) driven by a motor so as to be movable in a direction perpendicular to the disc arrangement direction, in a manner such that with the movement of the moving member(s), the disc drawing means can be moved to a height corresponding to a position of the selected disc. Further, a plurality of disc draw-out preventing elements are arranged in the disc arrangement direction corresponding to a plurality of discs stored in the disc storing means, each disc draw-out preventing element is adapted to be in either a disc draw-out preventing position or a released position. Moreover, the moving member has releasing portion(s) capable of positioning one disc draw-out preventing element at a released position, said one disc draw-out preventing element being located at a height of a selected disc at which the disc drawing means has arrived.

In another aspect of the present invention, there is provided a disc changer for use in a disc player, said disc changer including a disc storing means for storing a plurality of discs arranged in a predetermined direction, a disc drawing

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means for drawing a selected disc from the disc storing means
to a reproducing position within the disc player, a
transporting means for transporting the disc drawing means in
the disc arrangement direction, so that the selected disc
5 drawn from the disc storing means can be reproduced in the
reproducing position. In particular, the transporting means
comprises moving member(s) driven by a motor so as to be
movable in a direction perpendicular to the disc arrangement
direction, in a manner such that with the movement of the
10 moving member(s), the disc drawing means can be moved to a
height corresponding to a position of the selected disc.
Further, a plurality of disc movement preventing elements are
arranged in the disc arrangement direction corresponding to a
plurality of discs stored in the disc storing means, each
15 disc movement preventing element is adapted to be in either a
disc movement preventing position or a released position, and
is normally urged so as to be located at a released position.
Moreover, each of the disc movement preventing elements has a
pressing portion adapted to be pressed by the moving member,
20 so that each disc movement preventing element can be located
in a disc movement preventing position by allowing its
pressing portion to be pressed by the moving member. In
addition, the moving member is formed with a plurality of
holes each of which is allowed to receive the pressing portion
25 of a disc movement preventing element, each of the holes being
so formed that when the disc drawing means has reached a

position corresponding to the selected disc, the pressing portion of a disc movement preventing element at a height corresponding to the selected disc can enter the hole. Further, each of the disc movement preventing elements will be located at a released position once the pressing portion of the disc movement preventing element enter one of said holes.

In a further aspect of the present invention, there is provided a disc changer for use in a disc player, said disc changer including a tray storing means for storing a plurality of trays (each mounting a disc) arranged in a predetermined direction, a tray drawing means for drawing a selected tray (mounting a selected disc) from the tray storing means to a reproducing position within the disc player, a transporting means for transporting the tray drawing means along the tray arrangement direction, so that the selected disc mounted on the tray drawn from the tray storing means can be reproduced in the reproducing position. In particular, the transporting means comprises moving member(s) driven by a motor so as to be movable in a direction perpendicular to the tray arrangement direction, in a manner such that with the movement of the moving member(s), the tray drawing means can be moved to a height corresponding to a position of the selected tray. Further, a plurality of tray movement preventing elements are arranged in the tray arrangement direction corresponding to a plurality of trays stored in the tray storing means, each tray movement preventing element is adapted to be in either a

tray movement preventing position or a released position, and
is normally urged so as to be located at a released position.
Moreover, each of the tray movement preventing elements has a
pressing portion adapted to be pressed by the moving member,
5 so that each tray movement preventing element can be located
in a tray movement preventing position by allowing its
pressing portion to be pressed by the moving member. In
addition, moving member is formed with a plurality of holes
each of which is allowed to receive the pressing portion of a
10 tray movement preventing element, each of the holes being so
formed that when the tray drawing means has reached a position
corresponding to the selected tray, the pressing portion of a
tray movement preventing element at a height corresponding to
the selected tray can enter the hole. Further, each of the
15 tray movement preventing elements will be located at a
released position once the pressing portion of the tray
movement preventing element enter one of said holes.

In a still further aspect of the present invention, after
the moving member is moved to a desired position, said moving
20 member is further moved so as to urge the tray movement
preventing element in a predetermined direction, thereby
pressing the tray by virtue of the tray movement preventing
element which has obtained an urging force.

The above objects and features of the present invention
25 will become better understood from the following description
with reference to the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1A is a plane view indicating a magazine for use in a disc changer made according to the present invention.

5 Fig. 1B is a side view of the magazine shown in Fig. 1.

Fig. 2A is a front view indicating the disc changer of the present invention.

Figs. 2B and 2C are explanatory views indicating hook members used in the disc changer of the present invention.

10 Fig. 3 is a plane view indicating the disc changer of the present invention.

Fig. 4A is a front view indicating part of a chassis structure of the disc changer of the present invention.

15 Fig. 4B is an explanatory view indicating a stopper element for use in the disc changer of the present invention.

Fig. 5 is a rear view (indicating a surface opposite to a surface shown in Fig. 2A) of the disc changer of the present invention.

20 Fig. 6 is a bottom view indicating a bottom structure of the disc change of the present invention.

Fig. 7 is an explanatory view indicating an operational relationship between a tray and a stopper element.

Fig. 8 is an explanatory view indicating an operational relationship between a tray and a stopper element.

25 Fig. 9 is a sectional view taken along line A-A in Fig. 8.

Fig. 10 is an explanatory view indicating an operational relationship between a tray and a stopper element.

Fig. 11 is an explanatory view indicating an operational relationship between a tray and a stopper element.

5 Figs. 12A - 12C are explanatory views indicating a disc changer made according to a prior art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

One embodiment of the disc changer made according to the present invention will be described in detail below with reference to Figs. 1 - 11 in which, an arrow x is used to represent a direction for a tray 11 to move into or out of a magazine 10, an arrow y is used to represent a direction in which the magazine 10 is allowed to move into or from a disc player, an arrow z is used to represent a direction along which a plurality of trays 11 are arranged in the magazine 10.

Fig. 1A is a plane view indicating an internal structure of the magazine 10, Fig. 1B is a front view of the magazine 10. In both Fig. 1A and Fig. 1B, reference numeral 10a is used to represent an opening formed on one side of the magazine 10. The internal side walls of the magazine 10 are formed with a plurality of horizontal grooves (not shown) each for holding a tray with a disc mounted thereon. Each of the trays 11 has a circular recess portion 11a which presents generally the same shape as a disc and has a notch 11b formed on one side thereof. Further, each tray 11 has an engaging

member 11c for use when the tray 11 is drawn out of the magazine 10.

Fig. 2 is a front view of a disc changer made according to the present invention. As shown in Fig. 2, the disc changer employs a generally case-like chassis structure 12 formed with a magazine insertion opening 13, so that the magazine 10 can be inserted into or moved from the disc player.

Further, on the front of the chassis structure 12 there is provided a generally L-shaped cam plate 14 movable reciprocatingly in the direction x. The cam plate 14 has elongated holes 14a and 14b formed in the direction x, and also has an inclined elongated hole 14c. The elongated hole 14a is slidably engaged by an engaging pin 12a of the chassis structure 12. Similarly, the elongated hole 14b is slidably engaged by an engaging pin 12b of the chassis structure 12. Further, the inclined hole 14c is engaged by an engaging pin 15a formed on one side of a reproducing section 15. The engaging pin 15a is also engaged in an elongated hole 12c (extending in the direction Z) formed on one side of the case-like chassis structure 12.

The reproducing section 15 is provided within the chassis structure 12 in a manner such that it can move in the vertical direction by virtue of a lift mechanism which will be discussed later in the specification. The reproducing section 15 is so formed that it can at first draw a selected

disc from the magazine 10 and then clamp the disc on a turntable so as to reproduce the information recorded on the disc.

On two mutually opposite side faces of the chassis structure 12, there are integrally formed two hook members 12d and 12e, in order that the chassis structure 12 may be floatingly supported by virtue of a pair of springs B.

The operation for attaching the springs B on to the two hook members 12d, 12e of the chassis structure 12 may be described as follow. Namely, at first, a spring B is attached on to the hook member 12d (having a generally C-shaped configuration). Then, the other end of the same spring B is pulled so as to be connected to a hook F formed on a chassis member C (not included in the chassis structure 12). Subsequently, the hook member 12e is connected on to another hook of the chassis member C through another spring B in the same manner, thereby completing the operation for attaching the two springs B. In this way, the operation for attaching the two springs B may be made easy without the necessity of providing a temporary spring hook which is otherwise needed in a prior art.

Fig. 3 is a plane view indicating the disc changer of the present invention. As shown in Fig. 3, a plurality of pressing elements 12f - 12i (for downwardly pressing the magazine 10 inserted in the disc player) are integrally formed on the surface of the chassis structure 12. In particular,

the pressing elements 12f and 12g adjacent to the magazine
insertion opening 13 are so formed that each of them is
narrower in its front portion than in its rear portion. In
this way, when the magazine 10 is inserted into or drawn from
the disc player, an undesired stress will not be collected on
these rear portions. Moreover, the front portion of each of
the pressing elements 12f and 12g has a slip-contact member 16
made of a synthetic resin, thereby ensuring a smooth movement
of the magazine 10 when it is inserted into or drawn from the
disc player.

On the other hand, the pressing elements 12h and 12i
remote from the magazine opening 13 are so formed that each of
them has an identical width both in its front portion and in
its rear portion. In fact, a bulging treatment has been
performed on each of the pressing elements 12h and 12i from
its front portion to its rear portion, making its front
portion bent slightly downward so as to properly press the
magazine 10 inserted in the disc player.

The reproducing section 15 is provided in the vicinity of
a position into which the magazine 10 is to be inserted, and
has a clamping mechanism 17 for clamping a disc.

The clamping mechanism 17 includes a two-stage gear 18
for transmitting a driving force from a motor (not shown), and
a driving gear 19 engaged with the gear 18. The driving
gear 19 is formed with two cam grooves 19a and 19b. A
switching plate 20 having a pin (not shown) engaged in and

movable along the cam groove 19a is allowed to move reciprocatingly in the direction x. By virtue of the specifically formed shape of the cam groove 19a, when the driving gear 19 is rotated, an arm member 20a of the switch plate 20 can make On/Off of a limit switch 22 provided on a base plate 21 of the switching plate 20, while an arm member 20b can make On/off of a limit switch 23 provided on the same base plate, thereby properly controlling the reproduction of a disc. In this way, it is possible to operate two switches with the use of only one operating member (switching plate 20), thereby simplifying the switch mechanism of the disc changer while at the same time improving the precision of the timing of the above On/Off operations.

On the other hand, a pivoting plate 24 has a pin engaged in and movable along the cam groove 19b of the driving gear 19. By virtue of a specific shape of the cam groove 19b, a pivoting plate 24 is caused to pivot about a pivotal shaft 24d so as to complete a semi-circular arc movement. In this way, a selected disc may be clamped in a predetermined position or un-clamped therefrom.

The reproducing section 15 has a tray drawing element 25 which can reciprocatingly move in the direction x and can catch the engaging member 11c of a tray 11 so as to move the tray (with a selected disc mounted thereon) on to a reproducing position. The tray drawing element 25 is shaped and located in a manner such that it will not bump against the

trays 11 when the magazine 10 is inserted into or taken from the disc player through a relative movement with respect to the chassis structure 12.

Further, on the inner surface of the chassis structure 12 there are provided a plurality of stopper elements 26 (Figs. 3 and 4) for preventing the trays 11 from accidentally jumping out of the magazine 10. On the other hand, the reproducing section 15 has a protruding portion 15d (Figs. 3 and 7) for pressing the stopper elements 26 against the inner surface of the chassis structure 12.

Fig. 4A is a view indicating an internal surface of the chassis structure 12, Fig. 4B is a side view indicating one of the stopper elements 26. As shown in Figs. 4A and 4B, each stopper element 26 has a rear portion 26A which is inserted through an elongate hole 12j formed in the direction z on the chassis structure 12, and has a protrudingly bent portion 26B protruding in the direction y. In detail, each protrudingly bent portion 26B is caused to protrude through an elongate hole 12k vertically formed in the direction z on the chassis structure 12. Further, each stopper element 26 has a stopper portion 26C bent in the direction y. By virtue of an engagement between a stopper portion 26C and an end portion 11d of a tray 11 (Fig. 7), it is sure to limit the movement of a tray 11 in the direction x. Moreover, a limiting member 27 is attached on the chassis structure 12 for limiting an undesired pivoting movement of the stopper portion 26C.

In the present embodiment, the stopper elements 26 are divided into two groups, with each group including six such elements and with each stopper element for use with one tray 11. In this way, each group of stopper elements 26 is also allowed to be used in a disc changer having a magazine storing only 6 discs.

Further, on the chassis structure 12 there are formed two elongate guide holes 12m and 12n all extending in the direction z. Two pins 15b and 15c formed on the reproducing section 15 are slidably engaged in the guide holes 12m and 12n (Fig. 5).

Fig. 5 is a view indicating an outer surface of the chassis structure 12. As shown in Fig. 5, a cam plate 28 is attached on said out surface in a manner such that it is reciprocatingly movable in the direction x. In detail, the cam plate 28 has three elongated guide holes 28a, 28b and 28c extending in the direction x, and two inclined holes 28d and 28e.

The guide hole 28a is engaged by an engaging pin 12o formed on the chassis structure 12, while the guide hole 28b is engaged by an engaging pin 12p and the guide hole 28c is engaged by an engaging hook 12r all formed on the chassis structure 12. Further, the inclined guide hole 28d is engaged by an engaging pin 15b, and the inclined guide hole 28e is engaged by an engaging pin 15c, all formed on the reproducing section 15.

Further, as shown in Fig. 5, a plurality of window holes 28f are formed in an inclined formation on the cam plate 28. When the cam plate 28 is moved in the direction x, the protrudingly bent portions 26B of the stopper elements 26 are allowed to protrude still further one by one through the window holes 28f (also one by one). In this way, when the cam plate 28 has caused the reproducing section 15 to arrive at a selected disc tray 11, the height of a window hole 28f of the cam plate 28 will become coincident with a stopper portion 26C of a stopper element 26 (which has become in contact with the selected tray 11).

Fig. 6 is a bottom plane view of the disc changer made according to the present invention.

As shown in Fig. 6, a driving mechanism is provided on the bottom of the chassis structure 12 for driving the cam plate 14 and the cam plate 28 in the direction x. Such a driving mechanism comprises a motor 29, a worm 30 attached on the front end of the rotating shaft of the motor 29, a two-stage gear 31 engaged with the worm 30, two-stage gears 32 and 33 for transmitting a driving force from the motor 29, a gear portion 34a formed on a lever member 34 and engaged with the two-stage gear 33, with the lever member 34 being pivotable about a support shaft 34b. Such a lever member 34 is connected with a spring 35 in a manner such that the lever member 34 itself is urged in the clockwise direction.

An engaging pin 34c provided on one end of the lever

member 34 is engaged in a guide hole 14d formed on a bent portion 14A of the cam plate 14. An engaging pin 34d formed on the other end of the lever member 34 is engaged in a guide hole 28g formed on a bent portion 28A of the cam plate 28.

5 In this way, by virtue of a driving force from the motor 29, the lever member 34 may be caused to rotate in the counter clockwise direction against an urging force of the spring 35, thereby causing the cam plate 14 to move to the left, while making the cam plate 28 to move to the right in Fig. 6. On

10 the other hand, by virtue of an opposite driving force from the motor 29, the lever member 34 may be caused to rotate in the clockwise direction against an pushing force of the spring 35, thereby causing the cam plate 14 to move to the right, while making the cam plate 28 to move to the left in Fig. 6.

15 In this way, with the movements of the cam plate 14 and the cam plate 28 in mutually opposite directions, the reproducing section 15 will be moved in the direction z, a selected disc will be drawn from a tray 11 and is clamped in position so as to be reproduced.

20 Further, on the bottom surface of the reproducing section 15 there is provided a spindle motor 36 for rotating a disc turntable (not shown).

An operation for moving the reproducing section 15 in the direction z will be described in detail with reference to

25 Figs. 2 - 6.

The pins 15a, 15b, 15c formed on the reproducing section

15 are engaged in the guide holes 12c, 12m and 12n of the chassis structure 12, with the pin 15a also engaged in the inclined guide holes 14c of the cam plate 14, and with the pins 15b, 15c also engaged in the inclined guide holes 28d and 28e of the cam plate 28, so that the reproducing section 15 is slidably supported on the cam plate 14 and the cam plate 28. The cam plates 14, 28 can receive a driving force from the motor 29 so as to be movable reciprocatingly in the direction x. In this way, the intersections of the guide holes 12c, 12m 12n with the inclined holes 14c, 28d, 28e are caused to shift, so as to move the reproducing section 15 in the direction z, causing a relative change in a positional relationship between the reproducing section 15 and the plurality of trays 11 stored in the magazine 10.

In this way, when the cam plate 14 is moved to the right in Fig. 2, the intersection of the guide hole 12c with the inclined hole 14c will move down, so that the engaging pin 15a will also move down. Meanwhile, the cam plate 28 is moved to the right in Fig. 5, the intersections of the guide holes 12m, 12n with the inclined hole 28d, 28e move down, so that the engaging pins 15b, 15c will also move down, thereby causing the reproducing section 15 to move down.

On the other hand, when the cam plate 14 is moved to the left in Fig. 2, the intersection of the guide hole 12c with the inclined hole 14c will move up, so that the engaging pin 15a will also move up. Meanwhile, the cam plate 28 is moved

to the left in Fig. 5, the intersections of the guide holes 12m, 12n with the inclined hole 28d, 28e will move up, so that the engaging pins 15b, 15c will also move up, thereby causing the reproducing section 15 to move up.

5 The above operation is controlled by a control means (not shown).

Further, an eject lever (not shown, but having a generally rectangular shape) is provided on the bottom of the chassis structure 12 in a position which allows the insertion of the magazine 10. Upon being pressed by the magazine 10, the eject lever will move together with the magazine 10 in the direction y.

When the magazine 10 has not been inserted in the disc player, the eject lever is urged towards the insertion opening 13 by means of an eject spring 40, one end of which is connected with chassis structure 12 while the other end of which is connected with the eject lever. On the other hand, when the magazine 10 is inserted into the disc player along the direction y against the eject spring 40, the eject spring 40 will be pressed by the magazine 10 so as to move in the direction y.

Further, in a magazine insertion position on the bottom of the chassis structure 12, there is provided a detection arm 37 which can pivot about a shaft 37a in the counter clockwise direction along a cam portion of the eject lever, and can make On/Off of a magazine detection switch (not shown) attached to

further into the disc player, the lock arm 39 is caused to pivot slightly in the clockwise direction along a groove formed on the magazine 10, so that the engaging portion 37b of the detection arm 37 as well as the engaging portion 39b of the lock arm 39 are caused to move rightwardly (in Fig. 6), thereby releasing the stopped state of the detection arm 37.

Then, the detection arm 37 is caused to pivot slightly in the counter clockwise direction along the cam portion of the eject lever. Meanwhile, the lock arm 39 (which is freely pivotable about the support shaft 39a) will partially engage in the groove formed on the magazine 10, thereby locking the magazine 10 on the chassis structure 12 by virtue of an urging force produced by the spring member 38.

In this way, once the magazine 10 is locked, the detection arm 37 will make ON the magazine detecting switch, thereby detecting that the magazine has been locked.

Next, explanation will be given to an operation for drawing out a selected tray from the magazine 10 on to the reproducing position in the disc player, with reference to Figs. 2 to 10.

At first, the reproducing section 15 is raised to an uppermost position within the disc player, while the cam plate 14 (on the front side of the disc player) is positioned on the left side (Fig. 2). At this time, the engaging pin 15a is located at the left end of the uppermost portion (horizontal portion) of the inclined hole 14c. Meanwhile, the cam plate

28 (on the rear side of the disc player) is positioned on the left side (Fig. 5), with the pins 15b and 15c respectively located at the left ends of the uppermost portions (horizontal portions) of the inclined holes 28d, 28e.

5 At this moment, since the reproducing section 15 is in the uppermost position within the disc player, the protrudingly bent portion 26B of each stopper element 26 (attached on the chassis structure 12) is pressed by a pressing portion 15d of the reproducing section 15 so that the
10 protrudingly bent portion 26B protrudes through the hole 12k (formed on the chassis structure 12) in the direction y. In this manner, the protrudingly bent portion 26B being pressed by the pressing portion 15d, is caused to protrude outwardly through the uppermost hole 28f (formed on the cam plate 28),
15 thereby making the stopper portion 26C of the stopper element 26 to move away from an uppermost tray, thus rendering the uppermost tray to be movable in the direction x.

 At this time, the magazine 10 containing a plurality of discs is inserted through the insertion opening 13 into the
20 disc player in the direction y, the magazine 10 will then be fixed within the disc player by virtue of the detection arm 37. In this way, as shown in Fig. 7, the end portions 11d of the trays 11 are in contact with the stopper portions 26C of the stopper members 26, thereby preventing possible movement
25 of the trays 11 in the direction x, thus preventing the trays 11 from accidentally jumping out of the magazine 10.

When there is a command for reproducing a selected disc, the controller (not shown) enables the motor 29 to rotate so as to cause the cam plates 14 and 28 to move in the direction x. In detail, the cam plate 14 is moved to the right (in Fig. 2), causing the intersection of the guide hole 12c with the inclined hole 14c to move down, thereby moving down the engaging pin 15a. Meanwhile, the cam plate 28 is moved to the right (in Fig. 5), i.e., moved to the left (in Fig. 7), so that the intersections of the guide holes 12m, 12n with the inclined holes 28d, 28e are caused to move down, thereby moving down the engaging pins 15b and 15c. In this way, the reproducing section 15 may be moved down in the direction z, so as to reach a height corresponding to a selected tray mounting a selected disc which is to be reproduced.

At this moment, as shown in Fig. 8, the height of one of the window holes 28f formed on the cam plate 28 becomes coincident with the height of a stopper portion 26C (of a stopper element 26) engaged with the tray 11 mounting the selected disc.

Then, the protruding portion 15d of the reproducing section 15 will outwardly press a stopper element 26 at a height corresponding to the selected tray 11, so that a bent protruding portion 26B of the stopper element 26 is caused to protrude outwardly through a window hole 28f. In this manner, an engagement between the stopper portion 26C (of the stopper element 26) and the end portion 11d of the selected

tray is released, thereby making the selected tray 11 movable in the direction x (Fig. 9).

Then, as shown in Fig. 10, the selected tray 11 made movable in the direction x is drawn by a tray drawing element 25 provided on the reproducing section 15, so as to move the selected tray 11 to a disc reproducing position and clamp the selected disc on a turntable (not shown).

Subsequently, referring to Fig. 11, the cam plate 28 is slightly moved leftwardly (in Fig. 11), so as to make the window hole 28f to deviate away from the bent protruding portion 26B of the stopper element 26. Afterwards, the bent protruding portion 26B is again pressed by the cam plate 28, so that the stopper portion 26C may press an end portion 11e of the tray 11 in order to prevent a possible vibration of the tray 11, thereby starting reproducing the selected disc.

At this moment, other trays 11 not in the reproducing position are in a state shown in Fig. 7. Namely, each of these trays 11 is pressed at one end thereof by a stopper element 26 which is in turn pressed by the cam plate 28. In this way, it is exactly sure to prevent any of these trays 11 from jumping accidentally out of the magazine 10.

Although it has been described in the above embodiment that a tray 11 stored in the magazine 10 is at first selected and then a disc mounted by the tray 11 is reproduced, the principle of the present invention can also be applied to other type of a disc player, in which the discs directly

stored in slots of a disc housing may be directly held so as to be drawn out.

Moreover, the means for preventing jumping of the trays 11, may be provided with an additional shutter means. For example, a shutter means (movable in tray arrangement direction) may be provided between the magazine 10 and the reproducing section 15. By urging the shutter means in its movable direction, the drawing element 25 of the reproducing section 15 can press the shutter means, thereby forming a constitution in which the shutter means can cooperate with the drawing element 25.

In the disc changer made according to the present invention, a plurality of disc draw-out preventing elements are arranged in the disc arrangement direction corresponding to a plurality of discs stored in the disc storing means, each disc draw-out preventing element is adapted to be in either a disc draw-out preventing position or a released position. Further, one of moving members has a plurality of releasing portions each of which is capable of positioning one disc draw-out preventing element at a released position, said one disc draw-out preventing element being located at a height of a disc at which the disc drawing means has arrived. With the use of the disc changer of the present invention, it has become possible to perform an improved control on the disc changer with a simplified internal structure, so that only a tray mounting a selected disc is allowed to be drawn out,

while other trays may be prevented from jumping out in the same direction.

Further, the disc changer made according to the present invention is so formed that after the moving members are moved to desired positions, one of the moving members is further moved so as to urge a movement preventing member in a predetermined direction, thereby pressing a selected tray by virtue of the movement preventing member having obtained an urging force. In this way, it is possible to prevent the tray from being vibrated or any other undesired movements, thereby ensuring a more stabilized operation of the disc player.

While the presently preferred embodiments of the this invention have been shown and described above, it is to be understood that these disclosures are for the purpose of illustration and that various changes and modifications may be made without departing from the scope of the invention as set forth in the appended claims.

WHAT IS CLAIMED IS:

1. A disc changer for use in a disc player, said disc changer including a disc storing means for storing a plurality of discs arranged in a predetermined direction, a disc drawing means for drawing a selected disc from the disc storing means to a reproducing position within the disc player, a transporting means for transporting the disc drawing means in the disc arrangement direction, so that the selected disc drawn from the disc storing means can be reproduced in the reproducing position,

wherein the transporting means comprises moving member(s) driven by a motor so as to be movable in a direction perpendicular to the disc arrangement direction, in a manner such that with the movement of the moving member(s), the disc drawing means can be moved to a height corresponding to a position of the selected disc;

wherein a plurality of disc draw-out preventing elements are arranged in the disc arrangement direction corresponding to a plurality of discs stored in the disc storing means, each disc draw-out preventing element is adapted to be in either a disc draw-out preventing position or a released position;

wherein the moving member has releasing portion(s) capable of positioning one disc draw-out preventing element at a released position, said disc draw-out preventing element

being located at a height of a selected disc at which the disc drawing means has arrived.

2. A disc changer for use in a disc player, said disc changer including a disc storing means for storing a plurality of discs arranged in a predetermined direction, a disc drawing means for drawing a selected disc from the disc storing means to a reproducing position within the disc player, a transporting means for transporting the disc drawing means in the disc arrangement direction, so that the selected disc drawn from the disc storing means can be reproduced in the reproducing position,

wherein the transporting means comprises moving member(s) driven by a motor so as to be movable in a direction perpendicular to the disc arrangement direction, in a manner such that with the movement of the moving member(s), the disc drawing means can be moved to a height corresponding to a position of the selected disc;

wherein a plurality of disc movement preventing elements are arranged in the disc arrangement direction corresponding to a plurality of discs stored in the disc storing means, each disc movement preventing element is adapted to be in either a disc movement preventing position or a released position, and is normally urged so as to be located at a released position;

wherein each of the disc movement preventing elements has

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a pressing portion adapted to be pressed by the moving member, so that each disc movement preventing element can be located in a disc movement preventing position by allowing its pressing portion to be pressed by the moving member;

wherein the moving member is formed with a plurality of holes each of which is allowed to receive the pressing portion of a disc movement preventing element, each of the holes being so formed that when the disc drawing means has reached a position corresponding to the selected disc, the pressing portion of a disc movement preventing element at a height corresponding to the selected disc can enter the hole;

wherein each of the disc movement preventing elements will be located at a released position once the pressing portion of the disc movement preventing element enter one of said holes.

3. A disc changer for use in a disc player, said disc changer including a tray storing means for storing a plurality of trays (each mounting a disc) arranged in a predetermined direction, a tray drawing means for drawing a selected tray (mounting a selected disc) from the tray storing means to a reproducing position within the disc player, a transporting means for transporting the tray drawing means along the tray arrangement direction, so that the selected disc mounted on the tray drawn from the tray storing means can be reproduced in the reproducing position,

wherein the transporting means comprises moving member(s) driven by a motor so as to be movable in a direction perpendicular to the tray arrangement direction, in a manner such that with the movement of the moving member(s), the tray drawing means can be moved to a height corresponding to a position of the selected tray;

wherein a plurality of tray movement preventing elements are arranged in the tray arrangement direction corresponding to a plurality of trays stored in the tray storing means, each tray movement preventing element is adapted to be in either a tray movement preventing position or a released position, and is normally urged so as to be located at a released position;

wherein each of the tray movement preventing elements has a pressing portion adapted to be pressed by the moving member, so that each tray movement preventing element can be located in a tray movement preventing position by allowing its pressing portion to be pressed by the moving member;

wherein the moving member is formed with a plurality of holes each of which is allowed to receive the pressing portion of a tray movement preventing element, each of the holes being so formed that when the tray drawing means has reached a position corresponding to the selected tray, the pressing portion of a tray movement preventing element at a height corresponding to the selected tray can enter the hole;

wherein each of the tray movement preventing elements

will be located at a released position once the pressing portion of the tray movement preventing element enter one of said holes.

4. A disc changer according to claim 3, wherein after the moving member is moved to a desired position, said moving member is further moved so as to urge the tray movement preventing element in a predetermined direction, thereby pressing the tray by virtue of the tray movement preventing element which has obtained an urging force.

Disc Changer

Abstract of the Disclosure

It is an object of the present invention to provide an improved disc changer having a simplified internal structure, capable of smoothly drawing out only a selected disc from a magazine while at the same time effectively preventing other discs from jumping out in the same direction. The disc changer includes a magazine for storing a plurality of discs, a disc drawing device for drawing a selected disc from the magazine, a transporting device for transporting the disc drawing device in the disc arrangement direction. The transporting device comprises moving members driven by a motor so as to be movable in a direction perpendicular to the disc arrangement direction. A plurality of disc draw-out preventing elements are arranged in the disc arrangement direction, each disc draw-out preventing element is adapted to be in either a disc draw-out preventing position or a released position. Further, one of the above moving members has a plurality of releasing portions each of which is capable of positioning one disc draw-out preventing element at a released position, said one disc draw-out preventing element being located at a height of a selected disc.

FIG.1 A

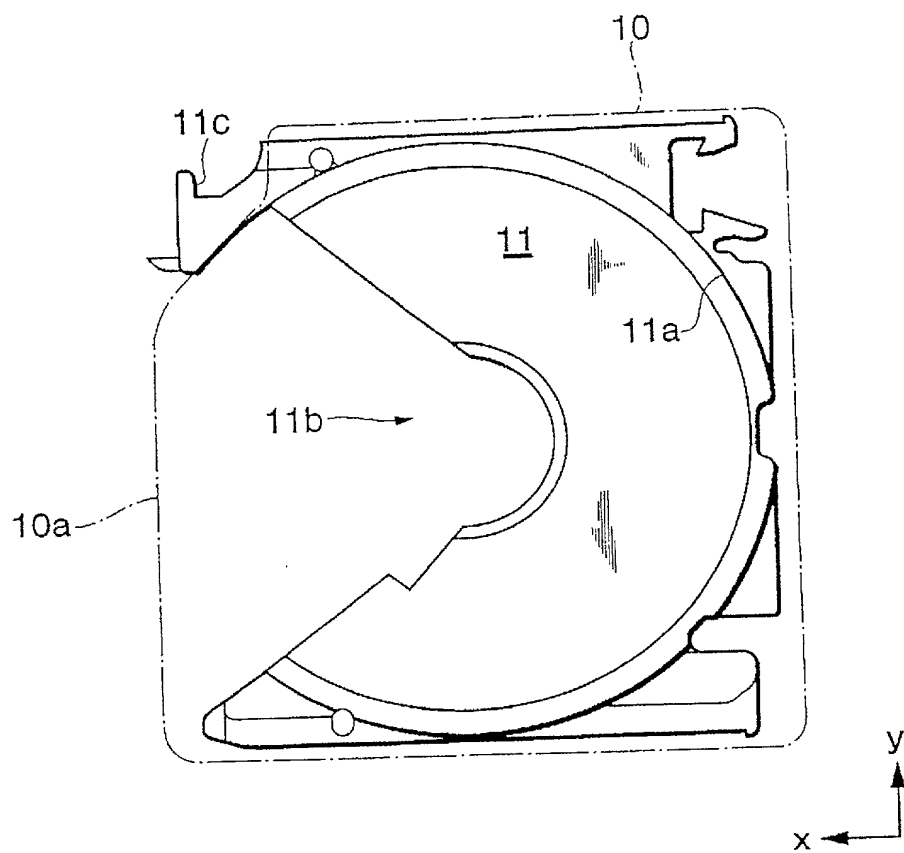
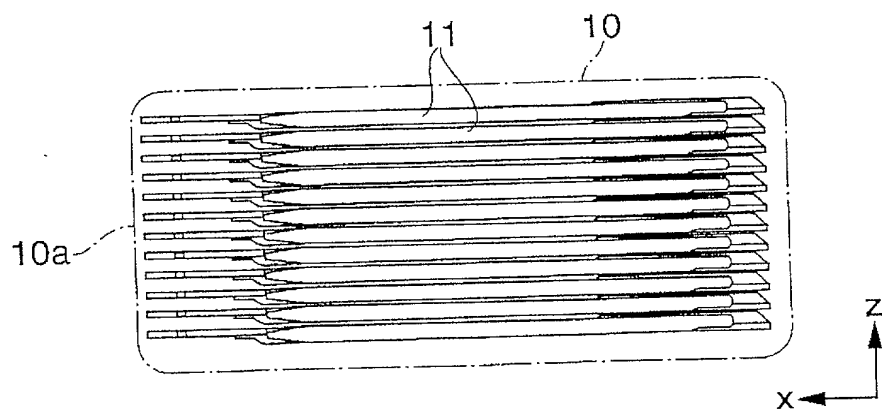


FIG.1 B



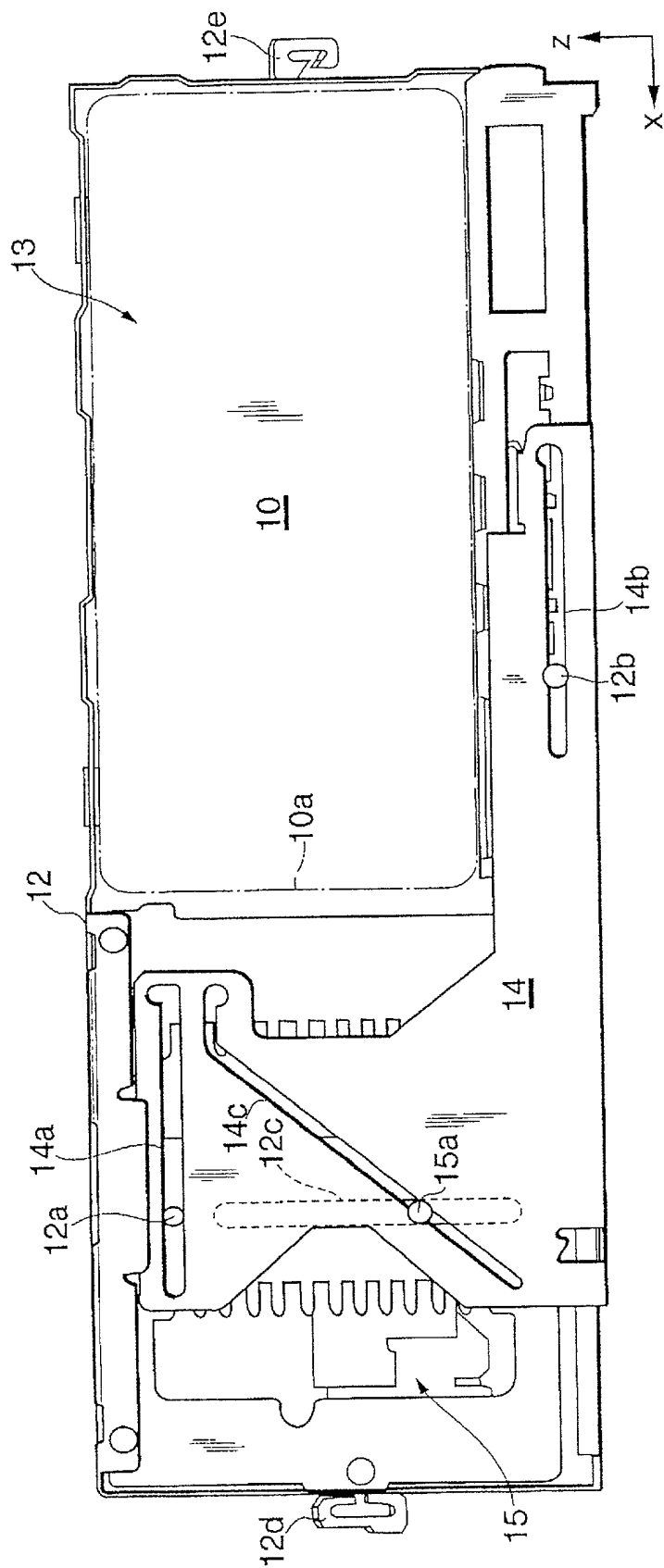


FIG. 2 A

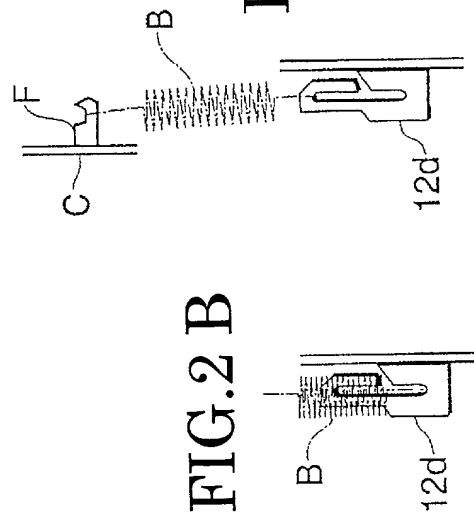


FIG. 2 B

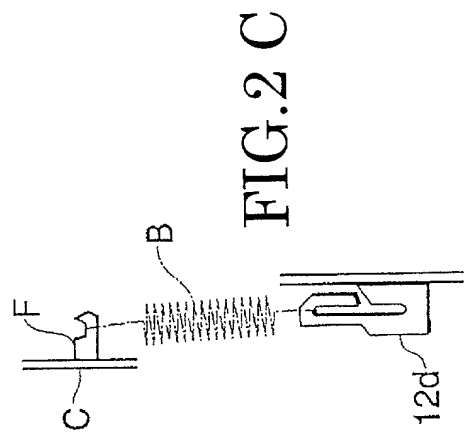


FIG. 2 C

FIG. 6

FIG. 6

FIG. 7

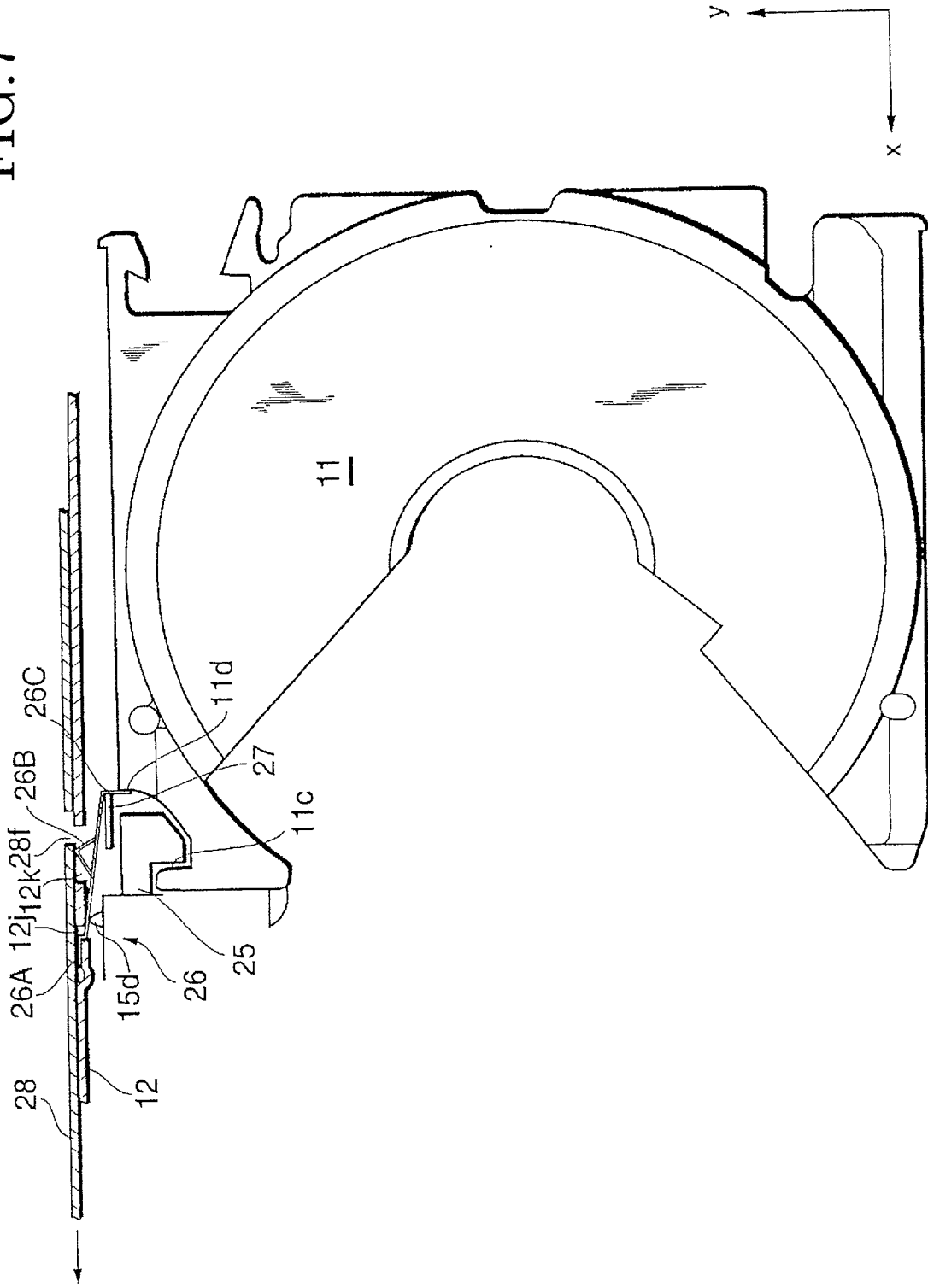


FIG. 8

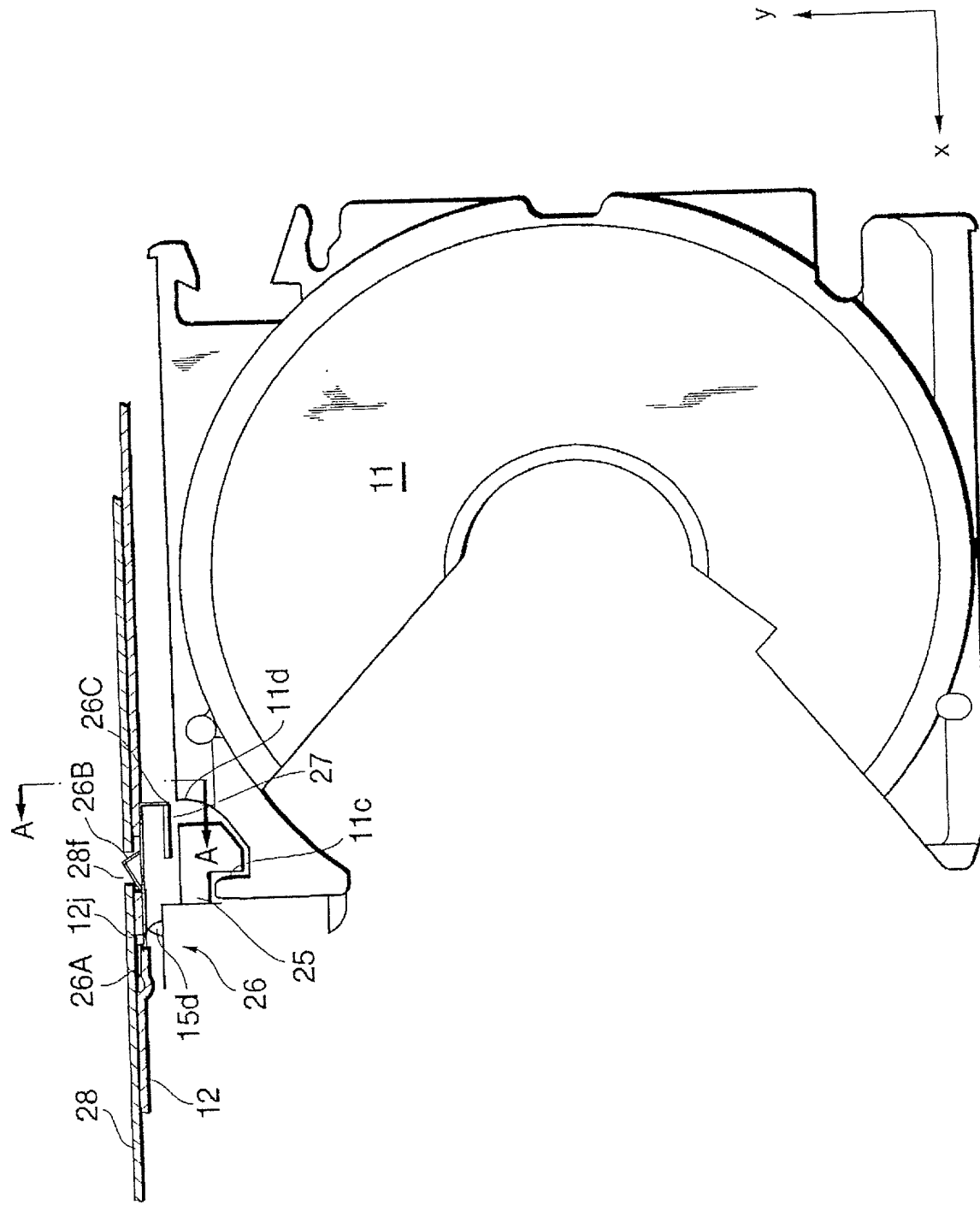


FIG.9

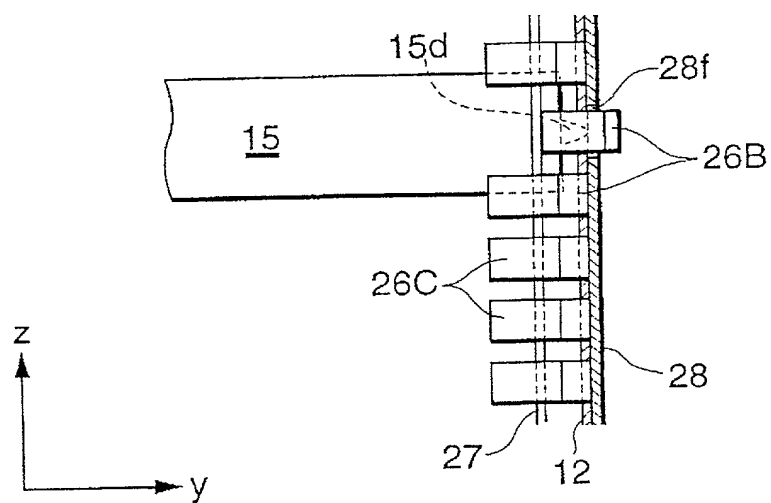


FIG.10

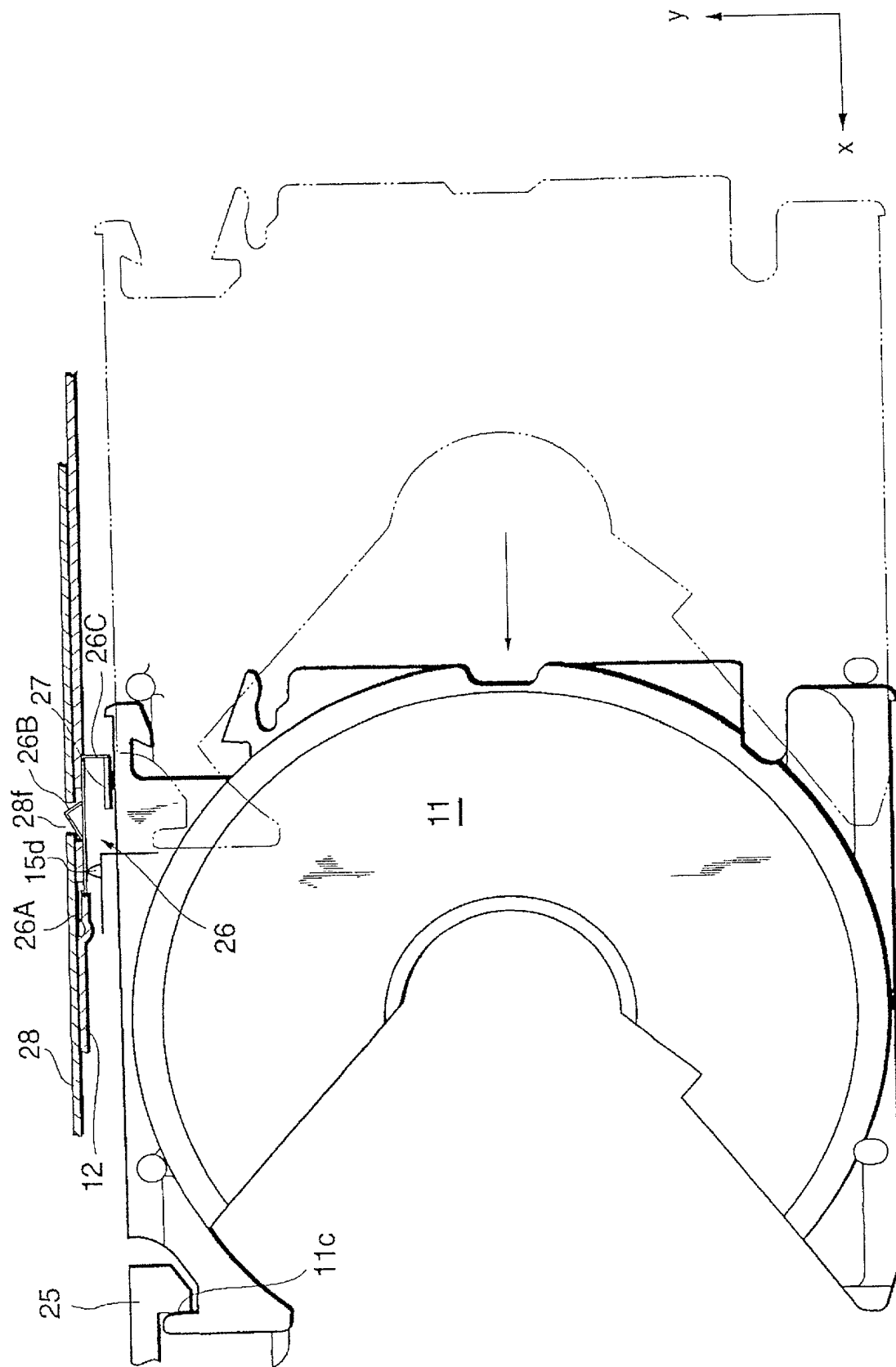


FIG.11

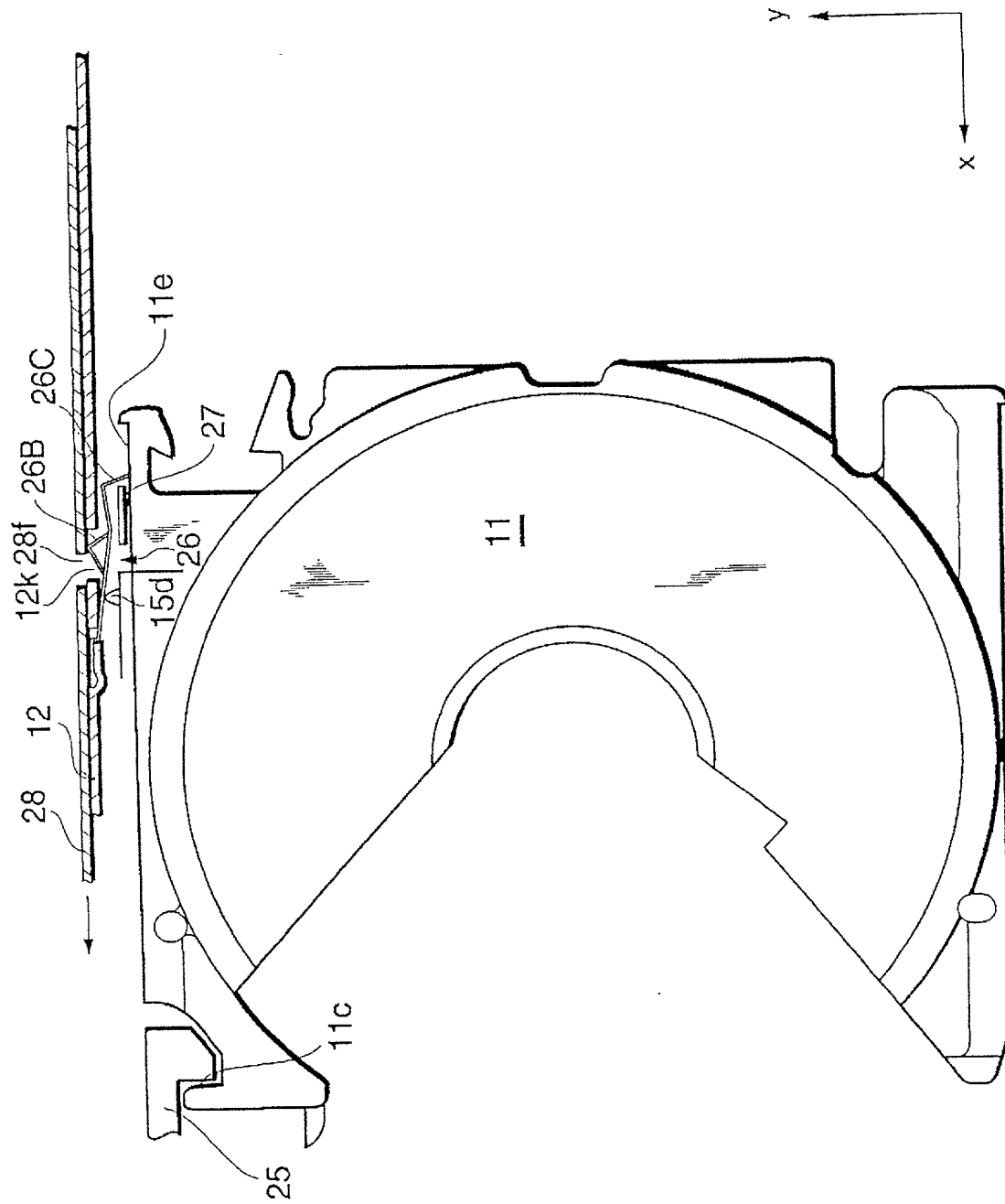


FIG.12A

PRIOR ART

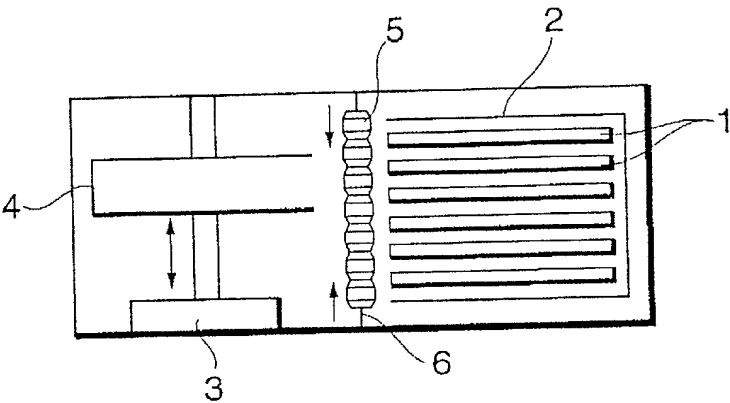


FIG.12B

PRIOR ART

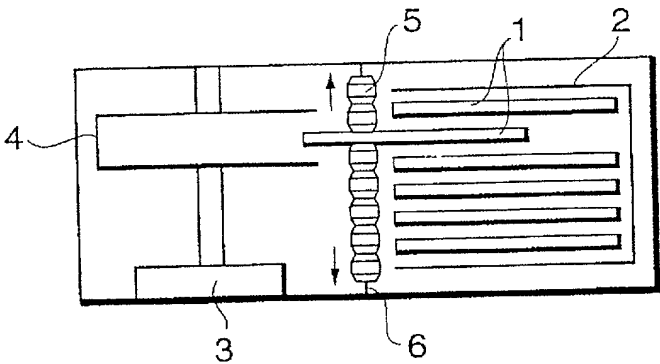
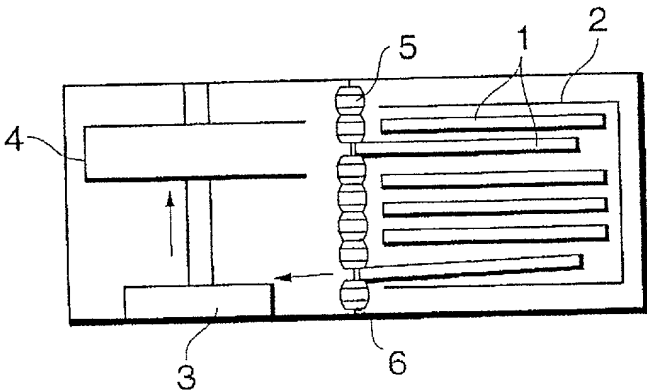


FIG.12C

PRIOR ART



As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled (Insert Title) "DISC CHANGER"

the specification of which is attached hereto unless the following box is checked:

☐ was filed on _____ as United States Application Number or PCT International Application Number _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate or PCT International Application having a filing date before that of the application(s) for which priority is claimed:

Priority Claimed

(List prior foreign applications. See note A on back of this page)	<u>11-56969</u>	<u>Japan</u>	<u>04/03/1999</u>	Priority Claimed <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	(Number)	(Country)	(Day/Month/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<u> </u>	<u> </u>	<u> </u>	<input type="checkbox"/> Yes <input type="checkbox"/> No
	(Number)	(Country)	(Day/Month/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

(Application Number)	(Filing Date)
(Application Number)	(Filing Date)

(See Note B on back
of this page)

☐ See attached list for additional prior foreign or provisional applications.

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s) or §365(c) of any PCT International application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior application(s) (U.S. or PCT) in the manner provided by the first paragraph of 35, U.S.C. §112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(List prior U.S. Applications or PCT International applications designating the U.S.)	(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
	(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)

And I hereby appoint as principal attorneys David T. Nikaido, Reg. No. 22,663; Charles M. Marmelstein, Reg. No. 25,895; George E. Oram, Jr., Reg. No. 27,931; Robert B. Murray, Reg. No. 22,980; Martin S. Postman, Reg. No. 18,570; E. Marcie Emas, Reg. No. 32,131; Douglas H. Goldhush, Reg. No. 33,125; Kevin C. Brown, Reg. No. 32,402; Monica Chin Kitts, Reg. No. 36,105; and Richard J. Berman, Reg. No. 39,107.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

(See Note C
on back of
this page)

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Inventor's signature Jun Togashi February 29, 2000
Date

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Citizenship Japan

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Variable	Mean	Standard Deviation	Minimum	Maximum
Age	34.5	10.2	22	55
Gender	0.45	0.50	0	1
Marital Status	0.65	0.48	0	1
Education	12.5	1.5	9	16
Income	3500	1200	1500	6000
Health	0.75	0.42	0	1
Smoking	0.35	0.48	0	1
Alcohol	0.25	0.43	0	1
Exercise	0.40	0.50	0	1
Stress	0.60	0.49	0	1
Sleep	0.55	0.50	0	1
Appetite	0.60	0.49	0	1
Mood	0.50	0.50	0	1
Energy	0.55	0.50	0	1
Concentration	0.50	0.50	0	1
Memory	0.50	0.50	0	1
Emotion	0.50	0.50	0	1
Behavior	0.50	0.50	0	1
Thought	0.50	0.50	0	1
Feeling	0.50	0.50	0	1
Perception	0.50	0.50	0	1
Attention	0.50	0.50	0	1
Intuition	0.50	0.50	0	1
Imagination	0.50	0.50	0	1
Reasoning	0.50	0.50	0	1
Logic	0.50	0.50	0	1
Analysis	0.50	0.50	0	1
Synthesis	0.50	0.50	0	1
Evaluation	0.50	0.50	0	1
Comparison	0.50	0.50	0	1
Classification	0.50	0.50	0	1
Organization	0.50	0.50	0	1
Planning	0.50	0.50	0	1
Problem Solving	0.50	0.50	0	1
Decision Making	0.50	0.50	0	1
Communication	0.50	0.50	0	1
Interpersonal Skills	0.50	0.50	0	1
Teamwork	0.50	0.50	0	1
Leadership	0.50	0.50	0	1
Management	0.50	0.50	0	1
Organization	0.50	0.50	0	1
Planning	0.50	0.50	0	1
Problem Solving	0.50	0.50	0	1
Decision Making	0.50	0.50	0	1
Communication	0.50	0.50	0	1
Interpersonal Skills	0.50	0.50	0	1
Teamwork	0.50	0.50	0	1
Leadership	0.50	0.50	0	1
Management	0.50	0.50	0	1

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